
33rd PIABA Annual Meeting

FEATURED BAD PRODUCT – AUTOCALLABLE STRUCTURED NOTES

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Autocallables 2024: by Craig McCann and Mike Yan

1-21

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Autocallables 2024

by Craig McCann and Mike Yan

Introduction

We have published extensively on structured products over the past 20 years. We published two papers dealing specifically with autocallable structured products – one in 2011 and one in 2015.¹ Since 2015, while we were focused on other research projects, the issuance of autocallable structured products has exploded, issuers have become more creative, the variety of products has proliferated and the potential for investor harm has increased.

This note brings us, and you, up to date on the market for autocallable structured products. We document the dramatic increase in issuance over the past 10 years, will illustrate autocallables with examples linked to Lucid and to Silicon Valley Bank and explain how issuers have gamed an SEC requirement since 2014 that 424(b)s include issue date fair market values.

The Rise of Autocallables

Reverse convertibles were short term notes which paid a high coupon rate and returned their face value so long as the underlying stock price didn't decline below or threshold value during the term of the note. Reverse convertibles had embedded short put options, typically written on individual stocks. Issuers had an incentive to link reverse convertibles to volatile stocks since the more volatile the stock, the more profitable it was to issue reverse convertibles, other things equal. Many of the stocks underlying reverse convertibles issued in late 2007 and the first 8 months of 2008 declined substantially by late 2008 and early 2009 when the notes matured.

Reverse convertibles thereafter were subject to heightened regulatory scrutiny and carried a well-deserved stench making them hard to market, even to unsophisticated investors.

Autocallable structured products were the industry's response to widespread losses on reverse convertible structured products occurring in 2008 and 2009. Rather than abandon the practice of attaching short put options to notes they issued, brokerage firms made it harder to identify the risky embedded options.

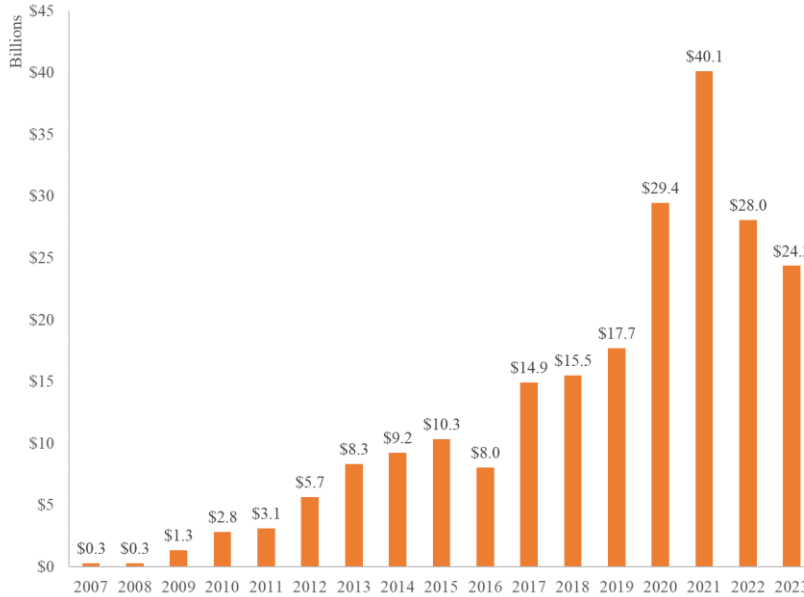
Table 1, Issuance by Year

Year	#	Issue Amount
2007	37	\$282,794,459
2008	68	\$270,086,102
2009	57	\$1,345,044,921
2010	266	\$2,812,737,341
2011	930	\$3,108,660,640
2012	2,144	\$5,651,224,141
2013	2,723	\$8,308,749,684
2014	3,836	\$9,226,406,535
2015	3,371	\$10,297,823,453
2016	3,585	\$8,024,115,704
2017	6,242	\$14,918,552,690
2018	7,010	\$15,462,423,100
2019	7,648	\$17,696,113,224
2020	11,195	\$29,430,665,338
2021	15,767	\$40,103,981,655
2022	12,162	\$28,038,022,635
2023	8,840	\$24,349,558,785
		\$219,326,960,406

¹ “Ex-post Structured Product Returns: Index Methodology and Analysis” with Geng Deng, Tim Dulaney, Tim Husson and Mike Yan, *Journal of Investing*, Summer 2015, Vol. 24, No. 2: pp. 45–58 and “Modeling Autocallable Structured Products” with Geng Deng and Joshua Mallett, 2011, *Journal of Derivatives & Hedge Funds* 17, 326–340.

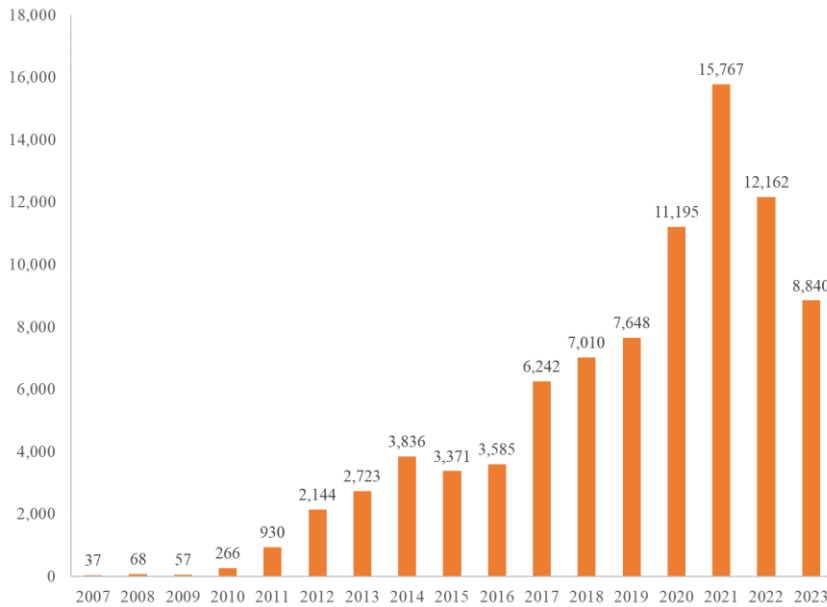
Table 1 and Figure 1 illustrate the dramatic rise in issuance of autocallable structured products. From 2007 to 2013, there were 889 issuances totaling \$3.1 billion per year on average. From 2014 to 2018, there were 4,809 issuances totaling \$11.6 billion per year on average. From 2019 to 2023, there were 11,122 issuances totaling \$27.9 billion per year on average. \$92.5 billion of autocallables have been issued in just the past three years.

Figure 1 Autocallable Issuance Amounts in \$ Billions, 2007-2023



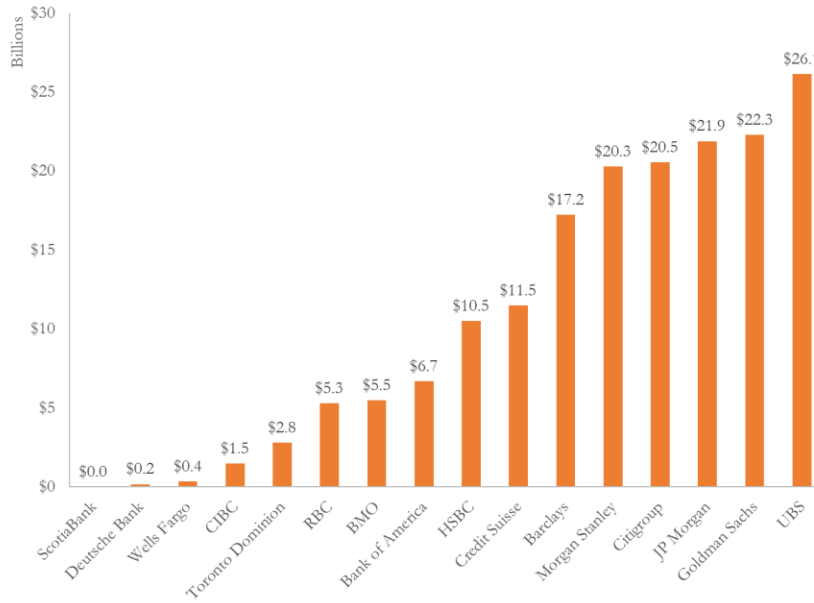
The number of autocallable issues plotted in Figure 2 follow the same pattern as the total issuance plotted in Figure 1. The average issue size remains remarkably steady each year at around \$2.5 million.

Figure 2 Number of Autocallable Issues, 2007-2023



The eight most prolific issuers of autocallable structured products account for almost 90% of the total issuance. Morgan Stanley, Citigroup, JP Morgan, Goldman Sachs and UBS have each issued more than \$20 billion of autocallable structured products. See Figure 3.

Figure 3 Autocallable Issuances in \$ Billions, by Issuer, October 2016 – December 2023



Some Key Features

At maturity, autocallables pay the note’s face value if the price of underlying stock on the valuation date shortly before the maturity date is above a percentage, eg. 70%, of the underlying stock’s closing price on the note’s pricing (also trade) date. This threshold price or level against which the underlying stock price is assessed is sometimes referred to as the “knock-in level”. If the underlying stock’s price on the valuation date is below this threshold, investors suffer the percentage decline in the underlying stock from the pricing date to the valuation date.

Autocallables pay an above market yield through monthly or quarterly coupons until they are called or mature. The high distributions are styled coupons but are – just like the high coupons on reverse convertibles – partial compensation for the risk that an investor will receive the value of depreciated stock rather than the note’s face value at maturity. For some autocallables, the coupon is only paid if the underlying stock remains above some percentage, eg. 50%, of the underlying stock’s closing price, referred to as the “coupon barrier”, on the note’s pricing (also trade) date. These notes are described as “contingent” coupon notes.

Autocallables have one or more possible call dates prior to maturity. Typically, if the underlying stock’s price is above its closing price on the note’s pricing date the note is automatically redeemed by the issuer at par, sometimes with an accrued coupon. This rules-based call feature gives rise to the “auto”callable moniker although we consider some notes which are callable on periodic call dates at the discretion of the issuer to be effectively autocallables

because issuers of both structures call the notes when the underlying stock has not declined as of a call date and therefore it is less likely contingent coupons would be zeroed out and maturity payoffs less likely to be reduced by stock losses than if the underlying stock had declined.

Autocallables can have multiple underlying stocks or stock indexes. If there are multiple underlying stocks, the return on the underlying stock with the lowest return from the pricing date to the coupon observation date, call observation date or valuation date at maturity is used to determine whether the coupon is paid, the note is called or the investor receives less than the note’s face value at maturity. These autocallable notes are “wort-of-basket” notes.

Part II: Lucid-linked Notes

Yesterday, we described the rapid growth in Autocallable structured products; \$122 billion sold in just the past 4 years. In this note we illustrate key features of autocallables with reference to the five notes linked to the stock price of Lucid.

CUSIP	Issuer	Underlying	Pricing Date	Issue Size
'22552XYG2	Credit Suisse	LCID; UBER	10/13/2021	\$1,000,000
'22552XZM8	Credit Suisse	LCID	10/29/2021	\$2,603,000
'22553P2K4	Credit Suisse	LCID; CHWY; SQ; PETS	11/2/2021	\$1,142,000
'17329UVC2	Citigroup	LCID	1/11/2022	\$1,500,000
'17329UMQ1	Citigroup	LCID; DOCU	1/11/2022	\$1,746,000

The first note was quickly called after paying just three out of 36 possible monthly coupons. Investors were given one quarter’s coupons and their money back because Lucid’s and Uber’s stock price didn’t fall far enough and fast enough for the issuer to expect they would fall enough, quick enough to cause the coupons to stop and the maturity payment to be much less than par. That is, autocallables are called if investors would likely benefit from continuing to own them and the notes continue to be held if investors would benefit if they were called.

The remaining four notes either only paid a few coupons or paid none at all. Investors are likely to receive less than \$10 per \$100 face value when they mature in the next twelve months.

[Contingent Coupon Autocallable Yield Notes due October 18, 2024](#)

These Credit Suisse notes had call features, coupons and maturity payoffs which were a function of the changes in the price of Lucid and Uber. The notes had a 3-year term, maturing on October 18, 2024 if not previously called by the issuer. Credit Suisse estimated the value of the notes on the pricing date was \$966.40. Credit Suisse paid brokers who sold the notes a 3.5% selling concession but if the notes were bought in an advisory account the purchase price was reduced from \$1,000 to \$965. [More on this curious fact in a later post.]

Credit Suisse priced these notes on October 13, 2021 when Lucid closed at \$22.59 and Uber closed at \$46.41.

Table 1 Credit Suisse’s October 13, 2021, 14.30% Lucid/Uber Barriers.

	Pricing Date	Barriers		
	10/13/2021	Coupon (60%)	Autocall (80%)	Knock-In (50%)
Lucid	\$22.59	\$13.554	\$18.072	\$11.295
Uber	\$46.41	\$27.846	\$37.128	\$23.205

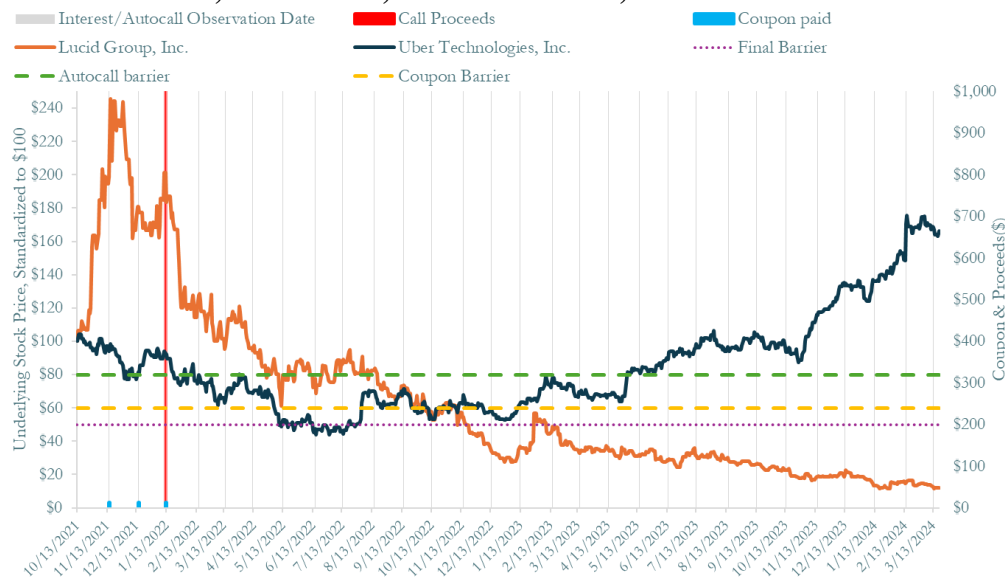
The notes paid contingent monthly coupons at 14.30% p.a. and had a coupon barrier of 60%. On each coupon observation date, if Lucid closed above \$13.554 and Uber closed above \$27.846, the coupon would be paid. If either closed below their coupon barriers, the coupon would not be paid.

The notes had an 80% autocall barrier. If both Lucid closed above \$18.072 and Uber closed above \$37.128 on a call observation date, Credit Suisse would redeem the notes and investors would receive the face value of the notes. We see many autocallables where the autocall level is 100%. The 80% level observed in this note meant it was highly likely it would be called.

The notes had a knock-in level of 50%. If the notes had not already been called, if either Lucid closed below \$11.295 or Uber closed below \$23.205 on the valuation date shortly before the maturity date, investors would receive the face value of the notes reduced by the percentage decline of the worst performing of Lucid and Uber.

Figure 4 plots the value of Lucid and Uber standardized to \$100 on October 13, 2021 along with the observation dates and coupon and call thresholds.

Figure 4 Lucid and Uber, October 13, 2021– March 25, 2024



On January 12, 2022, the first possible call date, Lucid closed at \$45.43 and Uber closed at \$43.08, both well above their autocall barriers. These notes were called by Credit Suisse after investors received only 3 coupons totaling 3.575% for bearing the risk that Lucid’s or Uber’s

stock price might have fallen and the investor would be stuck with an illiquid note paying no coupon, likely to pay much less than par at maturity.

Contingent Coupon Autocallable Yield Notes due November 5, 2024

These Credit Suisse notes had call features, coupons and maturity payoffs linked to changes in just the price of Lucid. Credit Suisse estimated the value of the notes on the pricing date was \$929.70. Credit Suisse paid brokers who sold the notes a 3.5% selling concession.

Credit Suisse priced these notes on October 29, 2021 when Lucid closed at \$36.99. The notes had a 3-year term, maturing on November 5, 2024.

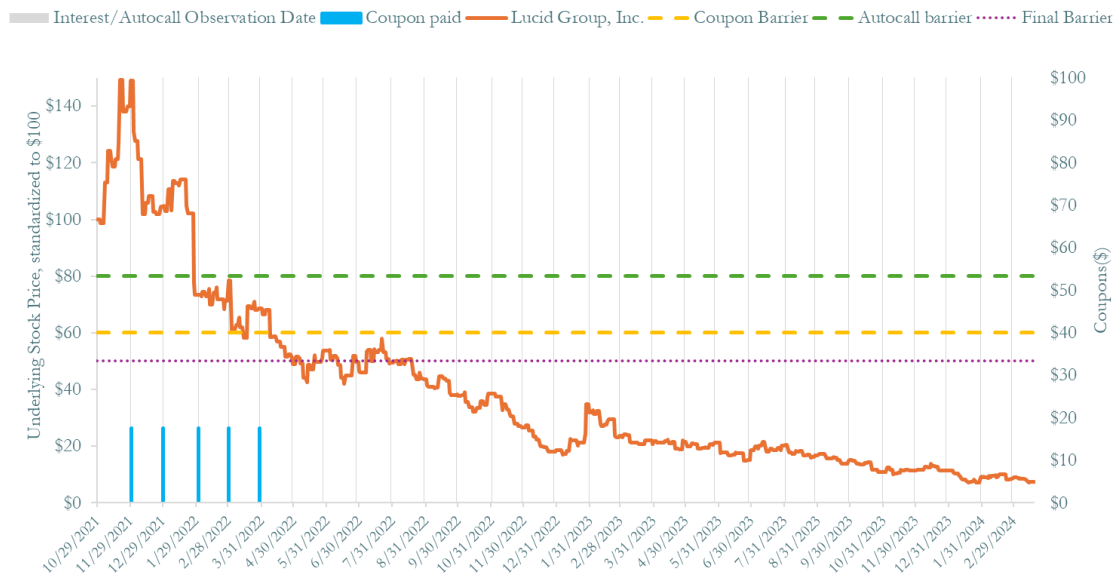
Table 2 Credit Suisse’s October 29, 2021, 21.0% Lucid Barriers.

	Pricing Date	Barriers		
	10/29/2021	Coupon (60%)	Autocall (80%)	Knock-In (50%)
Lucid	\$36.99	\$22.194	\$29.592	\$18.495

The notes paid a contingent coupon monthly at 21.0% p.a. and had a coupon barrier level of 60%. So long as the notes had not already been called, if Lucid closed above \$22.194 on a coupon observation date, a coupon would be paid. If Lucid closed below \$22.194 no coupon would be paid. The notes had an 80% autocall level. If Lucid closed above \$29.592 on a call observation date, Credit Suisse would redeem the notes and investors would receive the face value of the notes. The notes had a knock-in level of 50%. If the notes had not already been called, if Lucid closed below \$18.495 on the valuation date shortly before the maturity date, investors would receive the face value of the notes reduced by the percentage decline in Lucid’s stock price during the term of the note.

Figure 5 plots the value of Lucid standardized to \$100 on October 29, 2021 along with the observation dates and coupon and call thresholds.

Figure 5 Lucid, October 29, 2021 – – March 25, 2024



January 31, 2022, the first possible call date, Lucid closed at \$29.39 just \$0.20 less than the \$29.592 which would have caused the notes to be called and investors to receive the note’s face value. Instead, the notes survived this and all subsequent call observation dates as Lucid’s stock price continued to decline.

Lucid’s stock price closed below the 60% coupon barrier on April 28, 2022, didn’t pay the May 5, 2022 coupon or any coupon in the two years since. Lucid’s stock price is currently about 8% of its October 29, 2021 \$36.99 closing price and so noteholders are likely to get about \$80 per \$1,000 face value when the notes mature later this year.

Contingent Coupon Autocallable Yield Notes with Upper Threshold Feature due November 7, 2024 Linked to the Performance of Four Underlyings

These notes had call features, coupons and maturity payoffs linked to the price of Lucid, Chewy, Square and PetMed Express. The notes had a 3-year term, maturing on November 7, 2024 if not previously called. Credit Suisse estimated the value of the notes on the pricing date was \$959. Credit Suisse paid brokers who sold the notes a 3.25% selling concession but if the notes were bought in an advisory account the purchase price was reduced from \$1,000 to \$967.5.

Table 3 Credit Suisse’s November 2, 2021 Lucid/Chewy/Square/PetMed Barriers.

	Pricing Date	Barriers			
	11/2/2021	Coupon (60%)	Autocall (80%)	Knock-In (50%)	Upper Threshold (100%)
Lucid	\$35.13	\$21.078	\$28.104	\$17.565	\$35.13
Chewy	\$73.39	\$44.034	\$58.712	\$36.695	\$73.39
Square	249.01	\$149.406	\$199.208	\$124.505	\$249.01
PetMed Express	29.57	\$17.742	\$23.656	\$14.785	\$29.57

Credit Suisse priced these notes on November 2, 2021 when Lucid closed at \$35.13, Chewy closed at \$73.39, Square closed at \$249,01 and PetMed closed at \$29.57.

The notes had a coupon barrier level of 60%. The notes paid monthly coupons at a 21.0% p.a. rate so long as none of Lucid, Chewy, Square or PetMed’s closing stock price was below their coupon barrier on a coupon observation date and the notes had not been called.

The notes had an 100% autocall level. If all four underlying stock prices closed above their November 2, 2021 closing price on a call observation date, Credit Suisse would redeem the notes and investors would receive the notes’ face value.

The notes had a knock-in level of 50%. If the notes had not already been called, if any of the four underlying stocks closed below 50% of their November 2, 2021 closing prices on the valuation date shortly before the maturity date, investors would receive the face value of the notes reduced by the percentage decline of the worst performing of the four underlying stocks.

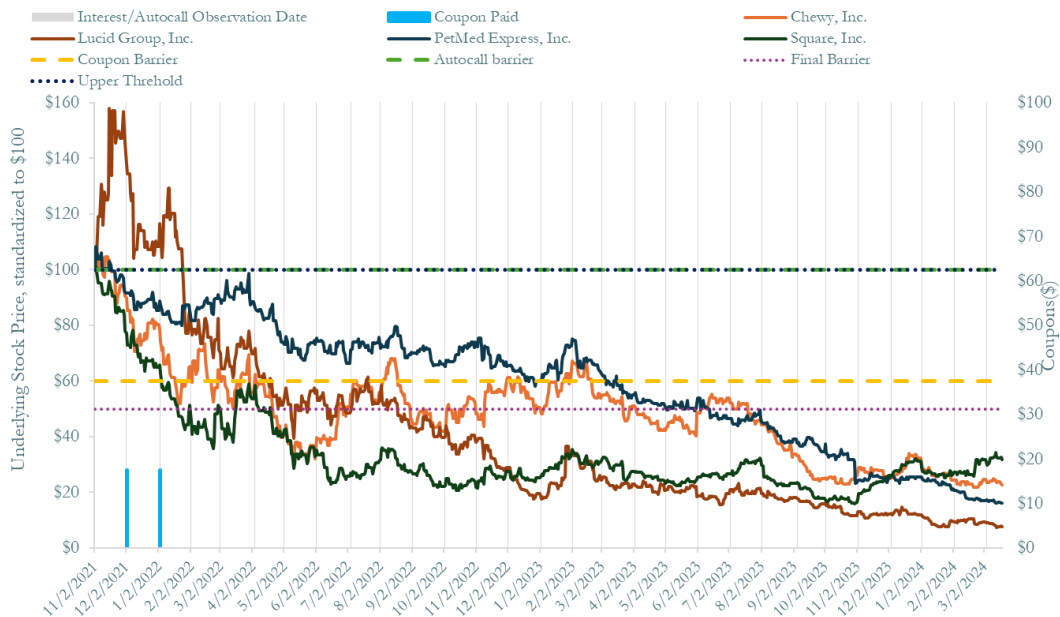
In addition to the added complication of four underlying stock prices to track, these notes had an “upper threshold feature”. If at least one of the underlying stock’s price was below its autocall barrier on every autocall date, the notes would survive to maturity. At maturity, if the worst performing stock had dropped below its knock-in level but at least one of the stocks closed

about its pricing date closing price, i.e. the “upper threshold level”, investors would receive the face value of the notes.

The notes passed the first two observation dates with at least one underlying stock price below its November 2, 2021 level but no underlying stock price below 50% of its November 2, 2021 level so the notes survived and paid the first two monthly coupons. On the third observation date, February 2, 2022, Square closed down 54% from its November 2, 2021 closing level and so the third coupon wasn’t paid. On all subsequent observation dates at least one of the underlying stock’s closing price was less than their coupon barrier and so no coupons beyond the first two, totaling 3.5%, have been paid.

Figure 6 plots the value of Lucid, Chewy, Square and PetMed Express standardized to \$100 on November 2, 2021 along with the observation dates and coupon and call thresholds.

Figure 6 Lucid, Chewy, Square and PetMed Express, November 2, 2021 – March 25, 2024



Chewy is currently down 77%, Square down 68%, Lucid down 92% and PetMed down 84% from their November 2, 2021 closing prices. Since there is little chance all four stocks will all recover to above 50% of their November 2, 2021 level, this note will only pay investors 3.5% in coupons over three years and less than 10% of the notes’ face value at maturity.

[Autocallable Contingent Coupon Equity Linked Securities Linked to Lucid Group, Inc. Due January 16, 2025](#)

The first three notes were issued by Credit Suisse within a few weeks in late 2021. Citigroup issued Autocallable notes linked to lucid on January 11, 2022. These notes had call features, coupons and maturity payoffs which were linked to the changes in the price of Lucid. The notes had a 3-year term, maturing on January 16, 2025 if not previously called. Citigroup estimated the value of the notes on the pricing date was \$910.70. Citigroup paid brokers who

sold the notes a 3.5% selling concession but if the notes were bought in an advisory account the purchase price was reduced from \$1,000 to \$975.

Citigroup priced these notes on January 11, 2022 when Lucid closed at \$45.47.

Table 4 Citigroup’s January 11, 2022 Barriers.

	Pricing Date	Barriers		
	1/11/2022	Coupon (60%)	Autocall (80%)	Knock-In (50%)
Lucid	\$45.47	\$27.282	\$36.376	\$22.735

The notes paid a monthly coupon at a 14.3% p.a. rate. The notes had a coupon barrier level of 60%. If the notes had not already been called, if Lucid closed below \$27.282 on a coupon observation date, no coupon would be paid.

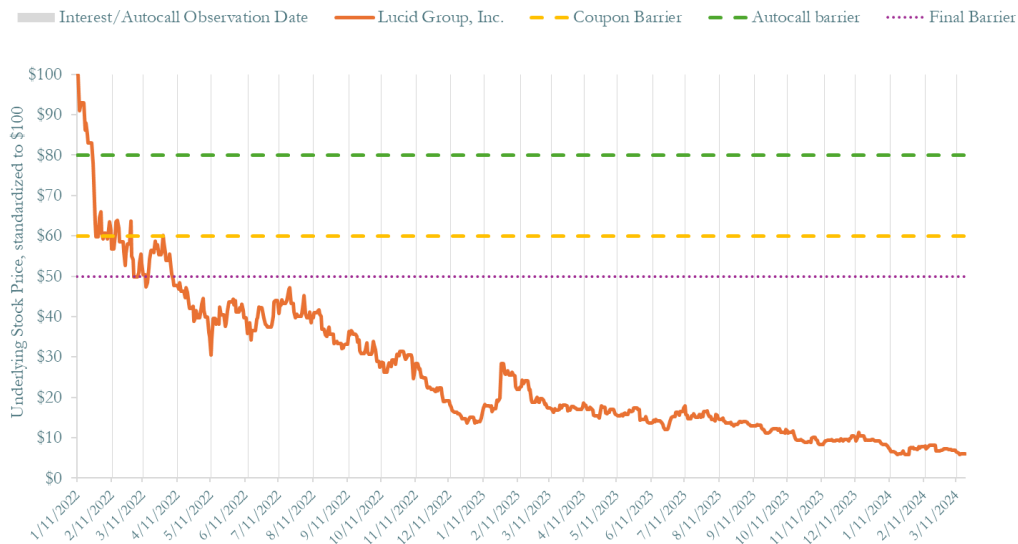
The notes had an 80% autocall level. If Lucid closed above \$36.376 on a call observation date, Citigroup would redeem the notes and investors would receive the face value of the notes.

The notes had a knock-in level of 50%. If the notes had not already been called, if Lucid closed below \$22.735 on the valuation date shortly before the maturity date, investors would receive the face value of the notes reduced by the percentage decline in Lucid’s stock price during the term of the note.

On the first valuation date, February 11, 2022, Lucid closed at \$25.84, down 43.3% from its January 11, 2022 closing price and so the very first coupon was not paid. Lucid’s stock price remained below \$27.282 and so no coupons have ever been paid on this note, none will likely ever be paid and investors are likely to get less than \$10 per \$100 face value when the notes mature in January 2025.

Figure 7 plots the value of Lucid standardized to \$100 on January 11, 2022 along with the observation dates and coupon and call thresholds.

Figure 7 Lucid, January 11, 2022 – March 25, 2024.



Autocallable Contingent Coupon Equity Linked Securities Linked to the Worst Performing of DocuSign, Inc. and Lucid Group, Inc. Due January 16, 2025

The last Lucid-linked note was priced by Citigroup on January 11, 2022 and had call features, coupons and maturity payoffs linked to changes in the price of Lucid and DocuSign. Citigroup estimated the value of the notes on the pricing date was \$905.70. Citigroup paid brokers who sold the notes a 3.75% selling concession but if the notes were bought in an advisory account the purchase price was reduced from \$1,000 to \$970.

Citigroup priced these notes on January 11, 2022 when Lucid closed at \$45.47 and DocuSign closed at 142.13. The notes had a 3-year term, maturing on January 16, 2025 if not previously called.

Table 5 Citigroup’s January 11, 2022 Barriers.

	Pricing Date	Barriers		
	1/11/2022	Coupon (60%)	Autocall (80%)	Knock-In (50%)
Lucid	\$45.47	\$27.282	\$36.376	\$22.735
DocuSign	\$142.13	\$85.278	\$113.704	\$71.065

The notes paid monthly coupons at a 20.5% p.a. rate so long as neither Lucid or DocuSign’s stock price declined by more than 40% on a coupon observation date and the notes had not been called.

If the notes had not already been called, if either Lucid closed below \$27.282 or DocuSign closed below \$85.278 on a coupon observation date, no coupon would be paid. If both Lucid and DocuSign close above their coupon barrier levels a coupon is paid.

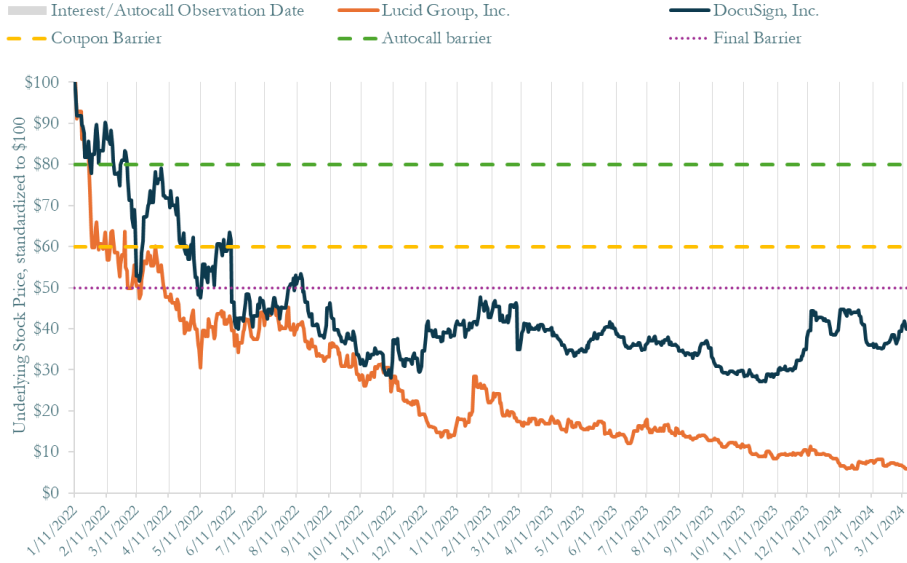
The notes had an 80% autocall level. If Lucid closed above \$36.376 and DocuSign closed above \$113.704 on a call observation date, Citigroup would redeem the notes and investors would receive the face value of the notes.

The notes had a knock-in level of 50%. If the notes had not already been called, if either Lucid closed below \$22.735 or DocuSign closed below \$71.065 on the valuation date shortly before the maturity date, investors would receive the face value of the notes reduced by the percentage decline of the worst performing of Lucid and Uber.

The first observation date was February 11, 2022. That day Lucid closed at \$25.84, below the \$27.282 coupon barrier level and so the very first contingent coupon was not paid. Lucid’s stock price fell thereafter and no subsequent contingent coupon has been paid. These notes are unlikely to pay more than \$10 per \$100 face value at maturity in January 2025.

Figure 8 plots the value of Lucid and DocuSign standardized to \$100 on January 11, 2022 along with the observation dates and coupon and call thresholds.

Figure 8 Lucid and DocuSign, January 11, 2022 – March 25, 2024



One of the five notes linked to Lucid described herein was called after a few coupons. The other four notes survived all autocall dates and are sure to survive the remaining call dates between now and their maturity dates. The four notes will pay approximately 10% of the notes face value.

Part III: Silicon Valley Bank-linked Notes

Five autocallable notes linked to Silicon Valley Bank were issued between August 2021 and March 9, 2023.

CUSIP	Issuer	Issue Date	Amount	Underlying	Coupon	Day-1 Value
22550MWA3	CreditSuisse	August 13, 2021	\$725,000	SVB	10.35%	\$979.10
78016FD35	RBC	January 27, 2022	\$887,000	SVB	10.00%	\$951.50
17330PKC2	Citi	June 29, 2022	\$732,000	SVB, Adobe, Intuit	11.40%	\$933.20
40441XL73	HSBC	February 14, 2023	\$1,301,000	SVB	11.15%	\$964.00
17331CZV2	Citi	March 9, 2023	\$593,000	SVB	21.27%	\$913.00

424bs for these five autocallables can be downloaded at these links:

[22550MWA3](#), [78016FD35](#), [17330PKC2](#), [40441XL73](#), [17331CZV2](#).

The first note, issued by Credit Suisse, had a 2-year term. The other four notes each had a 3-year term. Four of the five were linked only to SVB, one, issued by Citigroup, was linked to the worst performing of SVB, Adobe and Intuit.

The first note was callable at Credit Suisse's discretion at par plus an accrued coupon on 7 quarterly call dates. The other four notes were called if SVB, or the worst performing of SVB, Adobe and Intuit in the case of the third note, closed above the underlying's closing price on the

issue date. Four of the notes had contingent coupons; one had a 55% coupon barrier, two had 70% coupon barriers, and one had a 100% coupon barrier.

	Pricing Date	Underlying	Initial Price	Barriers		
				Coupon	Autocall	Knock-In
Credit Suisse	8/13/2021	SVB	\$581.73	\$407.21	discretionary	\$407.21
RBC	1/27/2022	SVB	\$542.74	\$379.92	\$542.74	\$379.92
Citigroup	6/29/2022	SVB	\$402.56	NA	\$402.56	\$201.28
		ADBE	\$368.50	NA	\$368.50	\$184.25
		INTU	\$389.66	NA	\$389.66	\$194.83
HSBC	2/14/2023	SVB	\$310.77	NA	\$310.77	\$155.39
Citigroup	3/9/2023	SVB	\$106.04	\$58.32	\$106.04	\$58.32

[Citigroup's \\$593,000 Autocallable Securities, Due September 12, 2024, Linked to SVB Financial Group Due September 12, 2024](#)

Inexplicably, Citigroup chose to issue this autocallable linked to SVB after the close on the disastrous March 9, 2023, amidst dozens of stories about the imminent collapse of SVB. March 9, 2023 was the trade date, March 14, 2023 was the settlement date. This note was worthless before it settled in customer accounts. Investors in these five autocallables linked to Silicon Valley Bank will receive virtually \$0 per \$1,000 at maturity. Some will receive a few coupon payments.

Silicon Valley Bank's initial price in the series of autocallables above (\$581.73, \$542.74, \$402.56 and \$310.77) illustrate the approach to SVB's collapse on March 9, 2023 and March 10, 2023. SVB closed at \$267.83 on March 8, 2023 and then dropped 60% to close at \$106.04 on March 9, 2023.

Figure 8 SVB Closing Price, February 16, 2023 - March 15, 2023

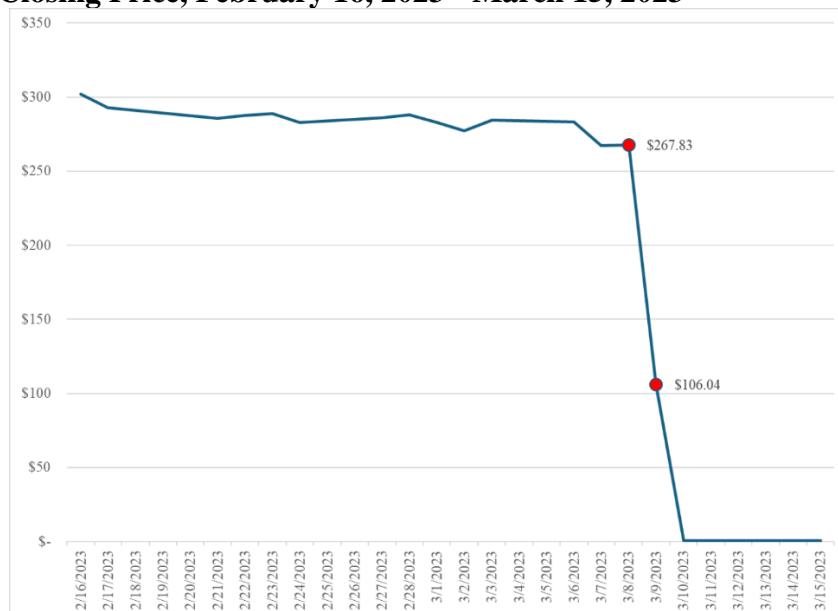
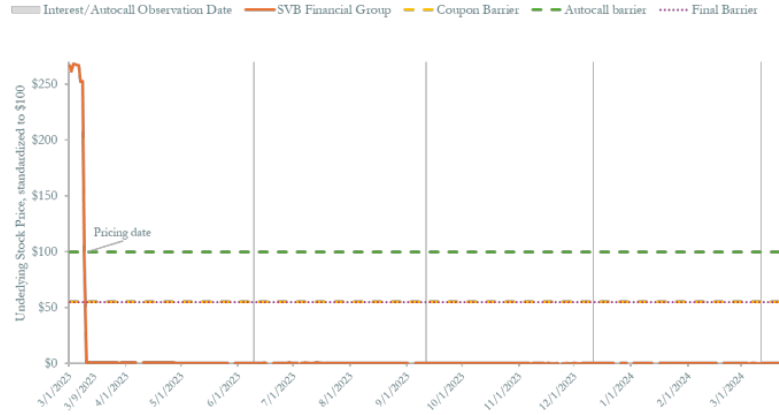


Figure 9 Citigroup's Note Has Not Paid Any Coupons



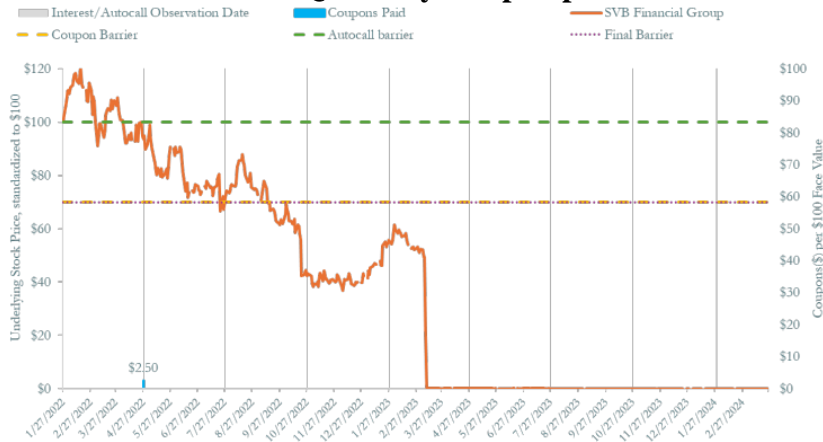
[Credit Suisse's \\$725,000 Contingent Coupon Callable Yield Notes due August 17, 2023 Linked to SVB](#)

Figure 10 Credit Suisse's Note Paid \$103.50 in 4 Quarterly Coupons and \$1.70 Per \$1,000 at Maturity



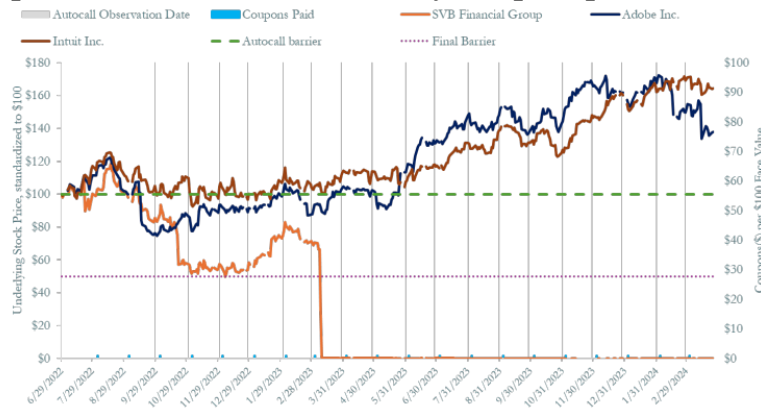
[RBC's \\$887,000 Autocallable Contingent Coupon Barrier Notes, Due January 30, 2025, Linked to SVB](#)

Figure 11 RBC's Note Paid \$2.50 in 1 Quarterly Coupon per \$100 Face Value



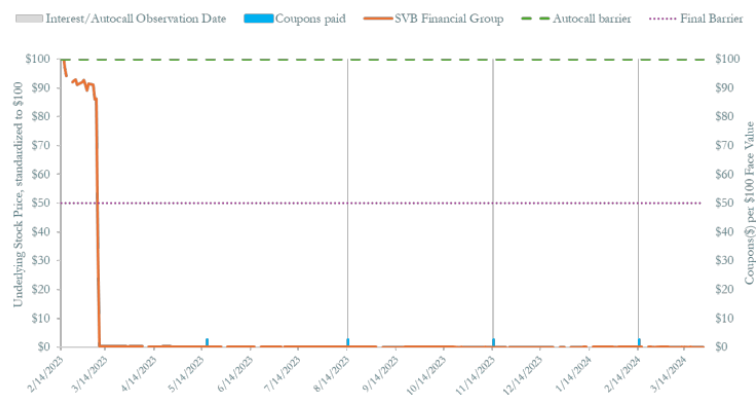
[Citigroup's \\$1,301,000 Autocallable Linked to Worst of Adobe, Intuit and SVB Due July 3, 2025](#)

Figure 12 Citigroup's Note Paid \$19 in 20 Monthly Coupons per \$100 Face Value



[HSBC's \\$1,301,000 Autocallable Notes Linked to SVB Due February 17, 2026](#)

Figure 13 HSBC's Note Paid \$11.15 in 4 Quarterly Coupons per \$100 Face Value



Part IV: Issuers' Day-1 Value Mischief

Some issuers overstate a key disclosure required by the Securities and Exchange Commission to be prominently displayed in the 424b filing for every structured product. Some issuers (Goldman Sachs and Morgan Stanley for examples) appear to adhere to the word and spirit of the SEC's guidance by using yields on their straight debt to estimate the Day-1 value of structured notes. Other issuers (Citigroup, Toronto Dominion and HSBC for examples) use internal funding rates but disclose qualitatively at least that if they had used secondary market yields their estimated Day-1 values would be lower.

On the other hand, UBS, Credit Suisse and Bank of Montreal appear to flout SEC guidance and instead provide meaningless Day - 1 values based on arbitrarily low discount rates and without any discussion of the impact of using these lower discount rates on the estimated values they place on 424bs.

UBS, Credit Suisse and Bank of Montreal issued \$43.1 billion of autocallable structured notes, and billions more in other types of structured notes with inadequate disclosures. Moreover, investors in Credit Suisse's autocallables which physically settle have lost at least \$100 million.

Since 2013, the SEC has required issuers to include an estimated value of structured products in the pricing supplement describing the terms of the security being offered. At the time, the SEC provided guidance to issuers in a February 21, 2013 letter from the Division of Corporation Finance. See for example, the letter sent to UBS available [here](#).

The SEC's intent to provide investors with the "market value" as well as the "purchase price" of the notes seems clear and is certainly laudable. Unfortunately, some issuers have taken extraordinary liberties in their calculations of Day-1 value such that, at best, the values reported in the 424bs should be viewed as an upper bound on the true value of the note.

The option components have to be valued by reference to observable option prices (and implied volatilities and correlations). The bond component on the other hand can be valued using yields on the issuers' straight debt which would include compensation for credit and liquidity risk. Using these "credit spreads" would result in a true FMV to the extent the structured notes are as liquid as the issuer's debt trading in secondary markets.

The SEC also allows the issuers to value the bond component using its internal funding rate. Some issuers appear to interpret "internal funding rate" to mean whatever the issuer wants to pay on the notes being issued, not at the rate the issuer allocates capital internally or the rate at which it values the outstanding notes as a liability in its accounting.

To get a rough idea of the range of discretion: Suppose Citigroup has 2-year bonds trading a yield to maturity of 5%. This 5% includes Citigroup's yield spread and would be a sensible discount rate to apply to the structured note to estimate a FMV ignoring the difference in liquidity between Citigroup's traded debt and the nontraded structured note. Suppose, given a note's parameters and the 5% discount rate derived from the yield on Citigroup's traded 2-year bonds, the estimated value of the newly issued note is \$930.

If instead, Citigroup instead discounts at 4% because that is the 2-year Treasury yield (also Citigroup's yield less its yield spread) the estimated value will be about 2% higher or \$948.

Some issuers seem to discount the structured notes future payments at whatever rate the issuer wants to pay to investors on the notes given it may have other costs which it is not supposed to include in the note's valuation. Continuing with our example, suppose the issuer structures the note to pay investors 2.5% so that the issuer can incur additional selling commissions, hedging costs and legal fees entailed in issuing the structured product and still pay less all-in that if the issuer had issued straight debt. Now, a very aggressive interpretation of the SEC's 2013 guidance would allow the issuer to value the notes using a 2.5% discount rate and our example note would be valued at \$976.

All of which is to say, the Day-1 values posted on 424bs sometimes look like my \$930, \$948 or \$976 examples and so are an upper bound on the FMV. In our example, the FMV is \$930.

Moreover, the SEC told issuers to inform investors of the impact of using something other than the yield on the issuers' traded debt or other similar debt. The issuers offering a Day-1 value based on any discount rate substantially less than the yield on their traded debt, could and should report the FMV. As we demonstrate below, when issuers use internal funding rates rather than discount rates which include credit spreads, they use nonsensical language which fails to address the SEC's disclosure requirements.

The issuers offering a Day-1 value based on any discount rate substantially less than the yield on their traded debt, could and should report the value using discount rates which include their credit spreads so investors can see the impact of using the lower internal funding rates.

Goldman Sachs \$60,000,000 Autocallable Nasdaq-100 Index®-Linked Notes due 2026

Goldman Sachs appears to meet the spirit of the SEC's disclosure rule in all the 424bs we recently reviewed. For example, its September 29, 2022 424b reads in part: ²

Estimated Value of Your Notes

*The estimated value of your notes at the time the terms of your notes are set on the trade date (as determined by reference to pricing models used by Goldman Sachs & Co. LLC (GS&Co.) and **taking into account our credit spreads**) is equal to approximately \$948 per \$1,000 face amount, which is less than the original issue price. The value of your notes at any time will reflect many factors and cannot be predicted; **however, the price** (not including GS&Co.'s customary bid and ask spreads) at which GS&Co. would initially buy or sell notes (if it makes a market, which it is not obligated to do) and the **value that GS&Co. will initially use for account statements and otherwise is equal to approximately the estimated value of your notes at the time of pricing, plus an additional amount (initially equal to \$52 per \$1,000 face amount).***

*Prior to January 29, 2023, the price (not including GS&Co.'s customary bid and ask spreads) at which GS&Co. would buy or sell your notes (if it makes a market, which it is not obligated to do) will equal approximately the sum of (a) the then-current estimated value of your notes (as determined by reference to GS&Co.'s pricing models) plus (b) any remaining additional amount (the additional amount will decline to zero on a straight-line basis from the time of pricing through January 28, 2023). On and after January 29, 2023, the price (not including GS&Co.'s customary bid and ask spreads) at which GS&Co. would buy or sell your notes (if it makes a market) will equal approximately the then-current estimated value of your notes determined by reference to such pricing models. **[Emphasis added.]***

² www.sec.gov/Archives/edgar/data/886982/000156459022033206/gs-424b2.htm

Thus, Goldman Sachs is using the yield on its debt to value the notes at \$948. It also discloses that the first few months it will add enough to the value of the notes when reporting a value of the notes on account statements so that investors won't notice a loss due to the difference between the \$1,000 purchase cost and the \$948 fair market value.

Morgan Stanley's Contingent Income Auto-Callable Securities due August 15, 2024

Like Goldman Sachs, Morgan Stanley uses a discount rate which incorporates its credit spread when valuing these notes at \$933. The 424b for this note at page 3 reads³

What goes into the estimated value on the pricing date?

In valuing the securities on the pricing date, we take into account that the securities comprise both a debt component and a performance-based component linked to the underlying stocks. The estimated value of the securities is determined using our own pricing and valuation models, market inputs and assumptions relating to the underlying stocks, instruments based on the underlying stocks, volatility and other factors including current and expected interest rates, **as well as an interest rate related to our secondary market credit spread, which is the implied interest rate at which our conventional fixed rate debt trades in the secondary market. [Emphasis added]**

Citigroup's Autocallable Barrier Securities Linked to the S&P 500® Index Due July 1, 2027

While Goldman Sachs and Morgan Stanley meet the spirit of the SEC's guidance, Citigroup does not. It uses an internal funding rate rather than the yield on its traded debt when valuing this note at \$964.20. This is implausibly high since the net proceeds to Citigroup is only \$970 per \$1,000. Citigroup's 424b reads at PS-9.4

Valuation of the Securities

CGMI calculated the estimated value of the securities set forth on the cover page of this pricing supplement based on proprietary pricing models. CGMI's proprietary pricing models generated an estimated value for the securities by estimating the value of a hypothetical package of financial instruments that would replicate the payout on the securities, which consists of a fixed-income bond (the "bond component") and one or more derivative instruments underlying the economic terms of the securities (the "derivative component"). **CGMI calculated the estimated value of the bond component using a discount rate based on our internal funding rate.** CGMI calculated the estimated value of the derivative component based on a proprietary derivative-pricing model, which generated a theoretical price for the instruments that constitute the derivative component based on various inputs, including the factors

³ www.sec.gov/Archives/edgar/data/895421/000183988221011274/ms2081_424b2-07008.htm

⁴ www.sec.gov/Archives/edgar/data/831001/000095010323009626/dp196046_424b2-us2333524.htm

described under “Summary Risk Factors—The value of the securities prior to maturity will fluctuate based on many unpredictable factors” in this pricing supplement, but not including our or Citigroup Inc.’s creditworthiness. These inputs may be market-observable or may be based on assumptions made by CGMI in its discretionary judgment.

For a period of approximately three months following issuance of the securities, the price, if any, at which CGMI would be willing to buy the securities from investors, and **the value that will be indicated for the securities on any brokerage account statements** prepared by CGMI or its affiliates (which value CGMI may also publish through one or more financial information vendors), **will reflect a temporary upward adjustment** from the price or value that would otherwise be determined. This temporary upward adjustment represents a portion of the hedging profit expected to be realized by CGMI or its affiliates over the term of the securities. The amount of this temporary upward adjustment **will decline to zero on a straight-line basis over the three-month temporary adjustment period**. However, CGMI is not obligated to buy the securities from investors at any time. See “Summary Risk Factors—The securities will not be listed on any securities exchange and you may not be able to sell them prior to maturity.” **[Emphasis added.]**

The same 424b at page PS-6 at least offers a qualitatively correct statement about the impact of using an internal funding rate which is lower than market yields to value the structured note.

The estimated value of the securities would be lower if it were calculated based on our secondary market rate. **The estimated value of the securities included in this pricing supplement is calculated based on our internal funding rate, which is** the rate at which we are willing to borrow funds through the issuance of the securities. **Our internal funding rate is generally lower than our secondary market rate, which is the rate that CGMI will use in determining the value of the securities for purposes of any purchases of the securities from you in the secondary market.** If the estimated value included in this pricing supplement were based on our secondary market rate, rather than our internal funding rate, it would likely be lower. **We determine our internal funding rate based on factors such as the costs associated with the securities, which are generally higher than the costs associated with conventional debt securities, and our liquidity needs and preferences. Our internal funding rate is not an interest rate that is payable on the securities. [Emphasis added.]**

The SEC instructed issuers to make substantially this Citigroup disclosure in the event the issuer uses an internal funding rate which does not incorporate credit spreads. Page 2 of the SEC's 2013 instructions to issuers including the following instruction.

If the internal funding rate is used we believe that you should include appropriate disclosure to describe how the use of an internal funding rate, rather than the secondary market credit spreads, impacts the user's valuation of the structured note.

Credit Suisse's \$1,142,000 Contingent Coupon Autocallable Yield Notes with Upper Threshold Feature due November 7, 2024 Linked to the Performance of Four Underlyings

Like Citigroup, Credit Suisse discloses it uses its internal funding rate to value newly issued structured products. Credit Suisse's 424b for this autocallable, it valued at \$959, includes at page 14: 5

- THE ESTIMATED VALUE OF THE SECURITIES ON THE TRADE DATE IS LESS THAN THE PRICE TO PUBLIC** — The initial estimated value of your securities on the Trade Date (as determined by reference to our pricing models and our internal funding rate) is less than the original Price to Public. The Price to Public of the securities includes any discounts or commissions as well as transaction costs such as expenses incurred to create, document and market the securities and the cost of hedging our risks as issuer of the securities through one or more of our affiliates (which includes a projected profit). These costs will be effectively borne by you as an investor in the securities. These amounts will be retained by Credit Suisse or our affiliates in connection with our structuring and offering of the securities (except to the extent discounts or commissions are reallocated to other broker-dealers or any costs are paid to third parties).
- **EFFECT OF INTEREST RATE USED IN STRUCTURING THE SECURITIES** — *The internal funding rate we use in structuring notes such as these securities is typically lower than the interest rate that is reflected in the yield on our conventional debt securities of similar maturity in the secondary market (our “secondary market credit spreads”).* If on the Trade Date our internal funding rate is lower than our secondary market credit spreads, we expect that the economic terms of the securities will generally be less favorable to you than they would have been if our secondary market credit spread had been used in structuring the securities. We will also use our internal funding rate to determine the price of the securities if we post a bid to repurchase your securities in secondary market transactions. See “—Secondary Market Prices” below. *[Emphasis added.]*

Remarkably, Credit Suisse's statements could allow for the use of an arbitrarily low discount rate. The worse Credit Suisse structured the note from the investor's perspective - the lower the expected return the note's structure implied - the lower the discount rate justified and the higher the reported Day-1 value. That is, under Credit Suisse' apparent interpretation of the SEC's guidance it could report a \$959 value whether the true FMV was \$959, \$929 or even \$899 because the lower the true FMV, the lower the yield will pay investors over the life of the note.

At least Citigroup was clear that using a market yield which reflected its credit spreads would lower the estimated Day-1 value compared to the value reported on the first page of the 424b.

⁵ www.sec.gov/Archives/edgar/data/1053092/000095010321017403/dp161343_424b2-u6271.htm

Credit Suisse's language isn't even close to what the SEC requires. The SEC told issuers to tell investors what the impact on the Day - 1 values would be of using market yields instead of internal funding rates. Instead of providing Citigroup's qualitatively correct disclosure, preferably quantified, Credit Suisse offered this meaningless word salad.

If on the Trade Date our internal funding rate is lower than our secondary market credit spreads, we expect that the economic terms of the securities will generally be less favorable to you than they would have been if our secondary market credit spread had been used in structuring the securities.

UBS AG \$301,000.00 Securities Linked to the common stock of D.R. Horton, Inc. due on December 27, 2024

www.sec.gov/Archives/edgar/data/1114446/000111444622005293/tc8007581f_1fwp.htm

UBS has issued over \$26 billion in autocallable structured notes in recent years using standard language that is similar to Credit Suisse's language. UBS does not state that using its secondary market yields instead of its internal funding rates to value the notes would result in a lower Day-1 values. UBS's standard language reads:

The issue price you pay for the Securities exceeds their estimated initial value - The issue price you pay for the Securities exceeds their estimated initial value as of the trade date due to the inclusion in the issue price of the underwriting discount, hedging costs, issuance costs and projected profits. **As of the close of the relevant markets on the trade date, we determined the estimated initial value of the Securities by reference to our internal pricing models and it is set forth in this final terms supplement.** The pricing models used to determine the estimated initial value of the Securities incorporate certain variables, including the price, volatility and expected dividends on the underlying asset, prevailing interest rates, the term of the Securities and our internal funding rate. **Our internal funding rate is typically lower than the rate we would pay to issue conventional fixed or floating rate debt securities of a similar term.** The underwriting discount, hedging costs, issuance costs, projected profits and the difference in rates will reduce the economic value of the Securities to you. Due to these factors, the estimated initial value of the Securities as of the trade date is less than the issue price you pay for the Securities. **[Emphasis added.]**

Autocallable Barrier Notes with Contingent Coupons due March 28, 2024 Linked to the Least Performing of the shares of VanEck Vectors® Gold Miners ETF and the shares of VanEck Vectors® Junior Gold Miners ETF⁶

⁶ www.sec.gov/Archives/edgar/data/927971/000121465921003804/c41212424b2.htm

Bank of Montreal at page 8 of the 424b uses meaningless, nonresponsive language similar to Credit Suisse's language.

The terms of the notes were not determined by reference to the credit spreads for our conventional fixed-rate debt. — To determine the terms of the notes, we used an internal funding rate that represents a discount from the credit spreads for our conventional fixed-rate debt. **As a result, the terms of the notes are less favorable to you than if we had used a higher funding rate.**

Of course, issuers should value structured products using the yields on their straight debt. Using an internal funding rate, especially a rate that can be whatever the issue structures the note to pay investors, allows for extraordinary mischief.

Issuers can and do lower the discount rate to whatever they want and call it an internal funding rate. By lowering the discount rate arbitrarily, issuers like UBS, Credit Suisse and Bank of Montreal can push Day-1 values arbitrarily close to the “proceeds to issuer” amount and thereby include in the Day-1 values costs and profits the SEC explicitly told them not to include in Day-1 values.

This mischief could be somewhat offset if UBS, Credit Suisse and Bank of Montreal told investors the Day-1 value is not a fair market value based on its secondary market yields as does Citigroup, Toronto Dominion and HSBC.

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